

~~WHAT IS CLAIMED IS:~~

1. An electrical apparatus comprising:  
2 two terminals accessible from an exterior of the electrical apparatus;  
3 an electrical element comprising a monolithic MOV disk having an outer surface and  
4 two ends, the ends being in contact with the two terminals; and  
5 a reinforcing structure attached to the outer surface, wherein the reinforcing structure  
6 comprises a fiber matrix pre-impregnated with a resin.

1 The apparatus of claim 1 wherein the monolithic MOV disk has a rating  
2 greater than 6 kV.

1 3. The apparatus of claim 1 wherein the monolithic MOV disk has a rating  
2 between approximately 6 kV and approximately 800 kV.

1 4. The apparatus of claim 1 wherein the electrical apparatus is constructed so as  
2 to withstand at least one 100 kA impulse.

1 5. The apparatus of claim 1 wherein the fibers in the fiber matrix are oriented in  
2 a predetermined orientation.

1 6. The apparatus of claim 1 wherein the fibers in the fiber matrix are oriented  
2 parallel to an axis of the electrical element.

1 7. The apparatus of claim 1 wherein the fibers in the fiber matrix are oriented in  
2 a random orientation.

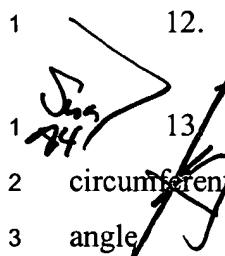
1 8. The apparatus of claim 1 wherein the fibers in the fiber matrix are of a  
2 uniform length.

1 9. The apparatus of claim 1 wherein the fibers in the fiber matrix are of a non-  
2 uniform length.

1           10. The apparatus of claim 1 wherein the fibers in the fiber matrix comprise  
2   fiberglass.

1           11. The apparatus of claim 1 wherein the fibers in the fiber matrix comprise a  
2   non-conductive material.

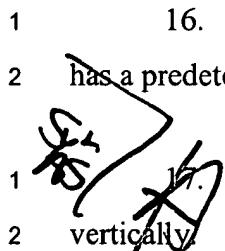
1           12. The apparatus of claim 1 wherein the fiber matrix is applied circumferentially.

1           13.  The apparatus of claim 12 wherein the fiber matrix is applied  
2   circumferentially such that the fibers have a predetermined orientation at a predetermined  
3   angle

1           14. The apparatus of claim 13 wherein the predetermined angle is an angle less  
2   than approximately 50 degrees.

1           15. The apparatus of claim 14 wherein the angle is between approximately 3  
2   degrees and approximately 10 degrees.

1           16. The apparatus of claim 12 wherein the circumferentially applied fiber matrix  
2   has a predetermined thickness.

1           17.  The apparatus of claim 1 wherein the pre-impregnated fiber matrix is applied  
2   vertically

1           18. The apparatus of claim 17 wherein the vertical application comprises at least  
2   one piece of fiber matrix placed in a vertical orientation along an axis of the electrical  
3   element.

1           19. The apparatus of claim 17 wherein the vertical application comprises a single  
2   piece of fiber matrix placed in a vertical orientation along an axis of the electrical element  
3   and having a sufficient width to cover the majority of an outer surface of the electrical  
4   element.

1        20. The apparatus of claim 1 wherein the reinforcing structure further comprises  
2 at least one layer of pre-impregnated fiber matrix applied circumferentially and at least one  
3 layer of pre-impregnated fiber matrix applied vertically.

1        21. ~~The apparatus of claim 1 wherein the reinforcing structure comprises a~~  
2 ~~coating of fiber segments embedded in an epoxy.~~

1        22. ~~An electrical apparatus comprising:~~  
2 ~~an electrical element comprising a bonded disk stack having an outer surface; and~~  
3 ~~a reinforcing structure attached to the outer surface, wherein the reinforcing structure~~  
4 ~~comprises a fiber matrix pre-impregnated with a resin.~~

1        23. ~~The apparatus of claim 22 wherein the disk stack comprises more than one~~  
2 ~~MOV disk.~~

1        24. The apparatus of claim 22 wherein the fibers in the fiber matrix comprise a  
2 non-conductive material.

1        25. The apparatus of claim 22 wherein the fiber matrix is applied  
2 circumferentially.

1        26. ~~The apparatus of claim 22 wherein the pre-impregnated fiber matrix is applied~~  
2 ~~vertically.~~

1        27. The apparatus of claim 22 wherein the reinforcing structure comprises at least  
2 one layer of pre-impregnated fiber matrix applied circumferentially and at least one layer of  
3 pre-impregnated fiber matrix applied vertically.

1        28. A method of reinforcing an electrical apparatus, the method comprising:  
2 providing at least one electrical element comprising a monolithic MOV disk having  
3 an outer surface and two ends, each end being in contact with a terminal accessible from an  
4 exterior of the electrical apparatus;

5           preparing a reinforcing layer for application to the outer surface of the electrical  
6    element, wherein the reinforcing layer comprises a fiber matrix pre-impregnated with resin;  
7    and

8           applying the reinforcing layer to at least a portion of the outer surface of the at least  
9    one electrical element.

1           29.    The method of claim 28 wherein the monolithic MOV disk has a rating  
2    greater than 6 kV.

1           30.    The method of claim 28 wherein the monolithic MOV disk has a rating  
2    between approximately 6 kV and approximately 800 kV.

1           31.    The method of claim 28 wherein the electrical apparatus is constructed so as  
2    to withstand at least one 100 kA impulse.

1           32.    The method of claim 28 wherein applying the reinforcing layer comprises  
2    circumferentially applying a pre-impregnated fiber matrix.

1           33.    The method of claim 28 wherein applying the reinforcing layer comprises  
2    vertically applying a pre-impregnated fiber matrix.

1           34.    The method of claim 28 further comprising performing post application  
2    processing of the reinforcing layer.

1           35.    The method of claim 34 wherein performing post application processing  
2    comprises curing.

1           36.    The method of claim 28 further comprising heating the element.

1           37.    The method of claim 36 wherein the element is heated between approximately  
2    100° F and 200° F.

1           38.     The method of claim 35 wherein curing the reinforcing layer comprises  
2 heating the reinforcing layer.

1           39.     The method of claim 38 wherein the reinforced layer is heated to between  
2 approximately 250° F and 400° F.

1           40.     A method of reinforcing an electrical apparatus, the method comprising:  
2           providing at least one electrical element comprising a bonded disk stack having an  
3 outer surface;  
4           preparing a reinforcing layer for application to the outer surface of the electrical  
5 element, wherein the reinforcing layer comprises a fiber matrix pre-impregnated with resin;  
6 and  
7           applying the reinforcing layer to at least a portion of the outer surface of the at least  
8 one electrical element.

1           41.     The method of claim 40 wherein applying the reinforcing layer comprises  
2 circumferentially applying a pre-impregnated fiber matrix.

1           42.     The method of claim 40 wherein applying the reinforcing layer comprises  
2 vertically applying a pre-impregnated fiber matrix.

1           43.     The method of claim 40 further comprising performing post application  
2 processing of the reinforcing layer.

1           44.     The method of claim 40 wherein performing post application processing  
2 comprises curing.

1           45.     A method of reinforcing an electrical apparatus, the method comprising:  
2           providing at least one electrical element comprising a monolithic MOV disk having  
3 an outer surface and two ends, each end being in contact with a terminal that is accessible  
4 from an exterior of the electrical apparatus;

5           preparing a reinforcing layer for application to the outer surface of the electrical  
6    element, wherein the reinforcing layer comprises a fiber matrix having a mixture of fiber  
7    segments pre-impregnated with resin; and

8           applying the reinforcing layer to at least a portion of the outer surface of the at least  
9    one electrical element.

1           46.    The method of claim 45 wherein applying the reinforcing layer comprises  
2    coating the element by dipping the element in the mixture of fiber segments and resin.

1           47.    The method of claim 45 wherein applying the reinforcing layer comprises  
2    coating the element by casting in a pre-impregnated fiber matrix.

1           48.    The method of claim 45 wherein applying the reinforcing layer comprises  
2    coating the element by powder coating in a fiber matrix.

1           49.    The method of claim 45 wherein applying the reinforcing layer comprises  
2    coating the element in a fiber matrix.

1           50.    A method of reinforcing an electrical apparatus, the method comprising:  
2            providing at least one electrical element comprising a bonded disk stack having an  
3    outer surface;  
4            preparing a reinforcing layer for application to the outer surface of the electrical  
5    element, wherein the reinforcing layer comprises a fiber matrix having a mixture of fiber  
6    segments pre-impregnated with resin; and  
7            applying the reinforcing layer to at least a portion of the outer surface of the at least  
8    one electrical element.

1           51.    The method of claim 50 wherein applying the reinforcing layer comprises  
2    coating the element by dipping the element in the mixture of fiber segments and resin.

1           52.    The method of claim 50 wherein applying the reinforcing layer comprises  
2    coating the element by casting in a pre-impregnated fiber matrix.

1           53. The method of claim 50 wherein applying the reinforcing layer comprises  
2 coating the element by powder coating in a fiber matrix.

1           54. The method of claim 50 wherein applying the reinforcing layer comprises  
2 coating the element in a fiber matrix.

